



- (51) **International Patent Classification:**
H02K 19/36 (2006.01) *H02K 11/02* (2006.01)
- (21) **International Application Number:**
PCT/IB2012/051687
- (22) **International Filing Date:**
5 April 2012 (05.04.2012)
- (25) **Filing Language:** Italian
- (26) **Publication Language:** English
- (30) **Priority Data:**
TO2011A000312 6 April 2011 (06.04.2011) IT
- (71) **Applicant (for all designated States except US):** **DENSO MANUFACTURING ITALIA S.P.A.** [IT/IT]; Viale Marisa Bellisario 75, I-66050 San Salvo (Chieti) (IT).
- (72) **Inventors; and**
- (75) **Inventors/Applicants (for US only):** **DI RISIO, Giammarco** [IT/IT]; Via Pian del Lago 15, I-66020 Casalbordino (Chieti) (IT). **PILUSO, Mario** [IT/IT]; Via di Montenero 2G, I-66050 San Salvo (Chieti) (IT). **MICCOLI, Rocco** [IT/IT]; C.da Foromorto 60/a, I-66023 Francavilla Al Mare (Chieti) (IT). **FIZZANO, Nicola** [IT/IT]; Via Cirillo 17/b, I-66054 Vasto (Chieti) (IT).
- (74) **Agents:** **FASSIO, Valeria** et al.; c/o Jacobacci & Partners S.p.A., Corso Emilia 8, I-10152 Torino (IT).
- (81) **Designated States (unless otherwise indicated, for every kind of national protection available):** AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.
- (84) **Designated States (unless otherwise indicated, for every kind of regional protection available):** ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Declarations under Rule 4.17:

- as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))

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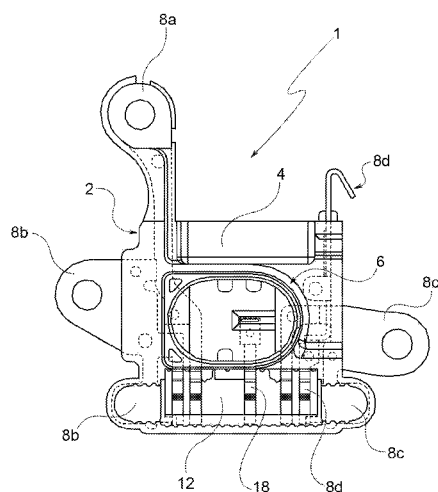
(54) **Title:** VOLTAGE REGULATOR FOR AN ALTERNATOR

FIG. 1

(57) **Abstract:** Voltage regulator (1), in particular for an alternator (10), comprising: - a connector (6) designed to perform the function of a communication interface between the alternator (10) and a control unit of an engine to which the alternator (10) is connected; - a capacitor (14) designed to be connected to the alternator (10), for performing the function of an anti-noise filter at radio frequencies; - a processing module (16) designed to be connected to the alternator (10), for managing operation thereof; - a heat sink (20) designed to dissipate the heat of the regulator (1); the regulator (1) being characterized in that: it comprises a casing (2) which is designed to be connected to the alternator (10) and defines a main cavity (4) designed to house the connector (6) and a secondary cavity (12) which is adjacent to the main cavity and designed to house the capacitor (14); the casing (2) is able to be fixed to the alternator (10) by means of four mechanical connection elements (8a, 8b, 8c, 8d), two of said connection elements (8b and 8c) being connected to the capacitor (14), a third one (8a) being connected and screwed to a brush holder of the alternator (10) and a fourth one being connected to the processing module (16); the processing module (16) is connected to the connector (6) by means of a conductor (18) and is connected to the four mechanical connection elements (8a, 8b, 8c, 8d); and the heat sink (20) is fixed to the processing module (16).



— *of inventorship (Rule 4.17(iv))*

Published:

— *with international search report (Art. 21(3))*

Voltage regulator for an alternator

The present invention relates to a voltage regulator for an alternator, in particular for a motor-vehicle engine.

More specifically, the present invention relates to a voltage regulator of the type defined in the preamble of Claim 1.

Voltage regulators comprising a processing module designed to manage operation of the alternator on which they are mounted are known.

These regulators are often bulky and composed of a plurality of bodies or cases which are interconnected and each include a different component of the regulator, such as the processing module, the heat sink, etc.

The object of the present invention is therefore to propose a voltage regulator which is compact and which has small dimensions.

This and other objects are achieved with the voltage regulator, whose characteristics are defined in Claim 1.

Particular embodiments form the subject of the dependent claims, the content of which is to be understood as forming an integral and integrating part of the present description.

Further characteristics and advantages of the invention will become clear from the following detailed description provided purely by way of a non-limiting example, with reference to the accompanying drawings in which:

- Figure 1 is a top plan view of a voltage regulator according to the present invention;
- Figure 2 is the same top plan view as in Figure 1, comprising also the capacitor;
- Figure 3 is a side view of the regulator according to Figure 1;

- Figure 4 is a perspective view of the regulator according to Figure 1;
 - Figure 5 is a top plan view of a variant of the voltage regulator according to Figure 1;
 - Figure 6 is the same top plan view as in Figure 5, comprising also the capacitor;
 - Figure 7 is a side view of the regulator according to Figure 5;
 - Figure 8 is a side view of the regulator mounted on an alternator;
 - Figure 9 is a top plan view of the regulator mounted on the alternator;
 - Figure 10 is a side view of the variant of the regulator mounted on an alternator;
- and
- Figure 11 is a top plan view of the variant of the regulator mounted on the alternator.

Figure 1 shows a voltage regulator 1 which comprises a casing 2 which defines a main cavity 4 designed to house a connector 6 designed, in a manner known per se, to perform the function of a communication interface between an alternator 10 shown in Figure 8 and a control unit of an engine to which the alternator is connected.

Four mechanical connection elements 8a, 8b, 8c and 8d are fixed to the casing 2 and are able to allow fixing of the casing 2 itself (and therefore the regulator 1) to the alternator 10.

A secondary cavity 12 adjacent to the main cavity 4 and designed to house a capacitor 14 is also defined inside the casing 2 as shown in Figure 2.

The capacitor 14 performs in a manner known per se the function of an anti-noise filter at radio frequencies. The capacitor 14 is connected by means of respective terminals (rheophores) 14a and 14b to the mechanical connection elements 8b and 8c which also perform the function of electrical connections since they are made of conductive material such as for example tin-plated steel. The terminal elements 8a and 8d also perform the electrical connection function.

The terminal element 8a is connected and screwed to a brush holder element of the alternator 10.

The terminal element 8d is designed to be electrically welded to a terminal of a rectifier bridge mounted in a manner known per se on the alternator 10. The terminal element 8d is connected, on the other hand, only to a processing module 16 described below.

Figure 3 is a side view of the regulator 1 showing the mechanical connection elements 8b, 8c and 8d and the connector 6. As can be noted, the connector 6 is arranged along a main axis X of the regulator 1, said axis X being the axis along which the casing 2 extends depthwise.

The bottom part of the regulator 1 contains a processing module 16, for example an integrated electronic circuit, which is connected to the connector 6 by means of a conductor 18 and also connected to the mechanical terminal elements 8a, 8b, 8c and 8d. The processing module 16 is designed to manage in a manner known per se the operation of the alternator 10.

A heat sink 20 fixed to said processing module 16 for example by means of an adhesive is present below the processing module 16.

The regulator 1 is assembled by first inserting the processing module 16 inside the casing 2, then fixing the heat sink 20 and finally positioning the capacitor 14 inside the secondary cavity 12. At this point, silicone is injected into the secondary cavity 12 in order to insulate the capacitor 14 and the processing module 16.

Figure 4 is a perspective view of the regulator 1 showing the connector 6, the mechanical terminal elements 8a, 8b, 8c and 8d, the heat sink 20 and a metal support 22 (preferably made of aluminium) integral with the alternator 10 and arranged to allow fixing the regulator 1 to the alternator 10.

Figure 5 shows a top plan view of a variant of the regulator 1 in which the connector 6 is not positioned along the axis X, but is arranged perpendicularly with respect thereto.

Figure 6 shows the same variant as in Figure 4, including also the capacitor 14.

Figure 7 is a side view of the variant of the regulator 1 according to Figures 5 and 6, showing the mechanical connection elements 8b, 8c and 8d, the connector 6, the processing module 16 and the heat sink 20. As can be noted, the connector 6 is arranged perpendicularly with respect to the axis X of the regulator 1.

Figure 8 is a side view of the regulator 1 mounted on the alternator 10, showing the connector 6, the mechanical terminal element 8d, the heat sink 20 and the metal support 22.

Figure 9 is a top plan view of the regulator 1 mounted on the alternator 10, showing the connector 6.

Figure 10 is a side view of the variant of the regulator 1 mounted on the alternator 10, showing the connector 6.

Figure 11 is a top plan view of the variant of the regulator 1 mounted on the alternator 10.

Obviously, without affecting the principle of the invention, the embodiments and the constructional details may be greatly modified with respect to that described and illustrated purely by way of a non-limiting example, without thereby departing from the scope of the invention as defined in the accompanying claims.

CLAIMS

1. Voltage regulator (1), in particular for an alternator (10), comprising:
 - a connector (6) arranged to perform the function of communication interface between the alternator (10) and a control unit of an engine to which the alternator (10) is connected;
 - a capacitor (14) able to be connected to the alternator (10), for performing the function of anti-noise filter at radio frequencies;
 - a processing module (16) able to be connected to the alternator (10), for managing operation thereof;
 - a heat sink (20) arranged to dissipate the heat of the regulator (1);the regulator (1) being characterized in that
it comprises a casing (2) arranged to be connected to the alternator (10), which defines a main cavity (4) arranged to house the connector (6) and a secondary cavity (12) adjacent to the main cavity and arranged to house the capacitor (14);
the casing (2) is able to be fixed to the alternator (10) by means of four mechanical connection elements (8a, 8b, 8c, 8d), two of said connection elements (8b and 8c) being connected to the capacitor (14), a third one (8a) being connected and screwed to a brush holder element of the alternator (10) and a fourth one being connected to the processing module (16);
the processing module (16) is connected to the connector (6) by means of a conductor (18) and is connected to the four mechanical connection elements (8a, 8b, 8c, 8d); and
the heat sink (20) is fixed to the processing module (16).
2. Regulator (1) according to Claim 1, wherein the four mechanical connection elements are made of conductive material.
3. Regulator (1) according to Claim 2 or 3, wherein the connector (6) is arranged along a main axis X of the regulator (1).
4. Regulator (1) according to Claim 2 or 3, wherein the connector (6) is arranged

perpendicularly with respect to a main axis X of the regulator (1).

5. Regulator (1) according to any one of the preceding claims, further comprising within the secondary cavity (12) silicone arranged to insulate the capacitor (14) and the processing module (16).

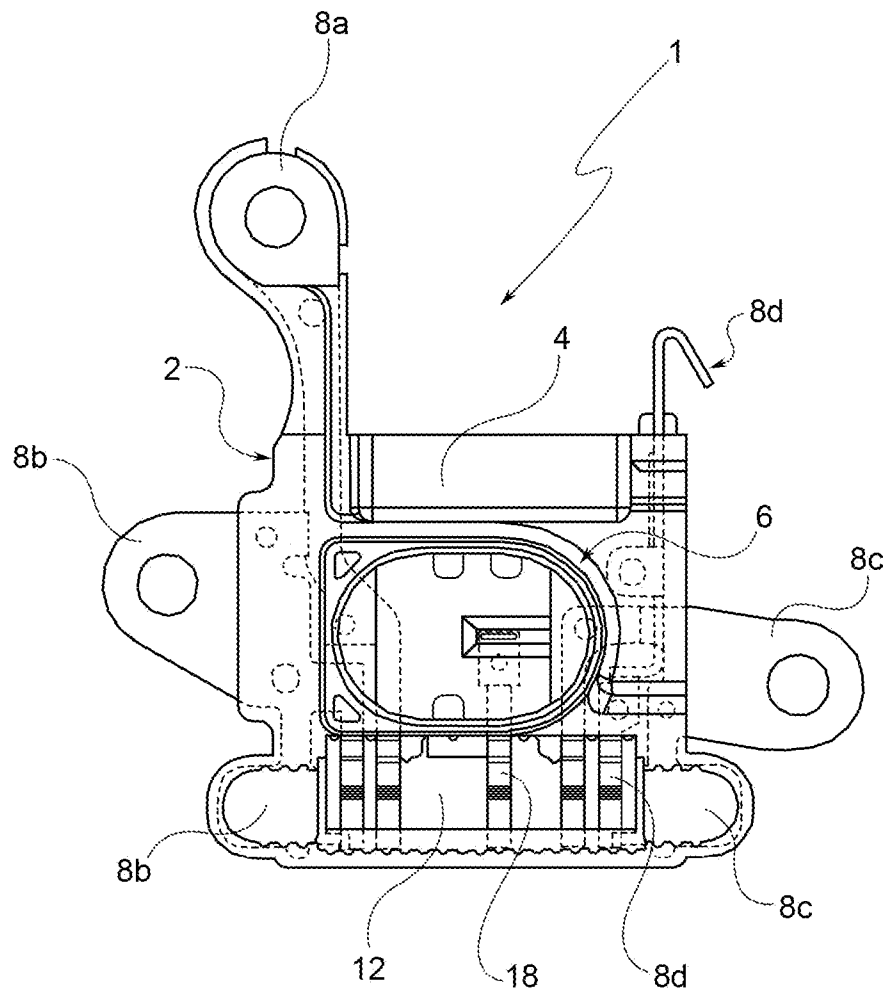


FIG. 1

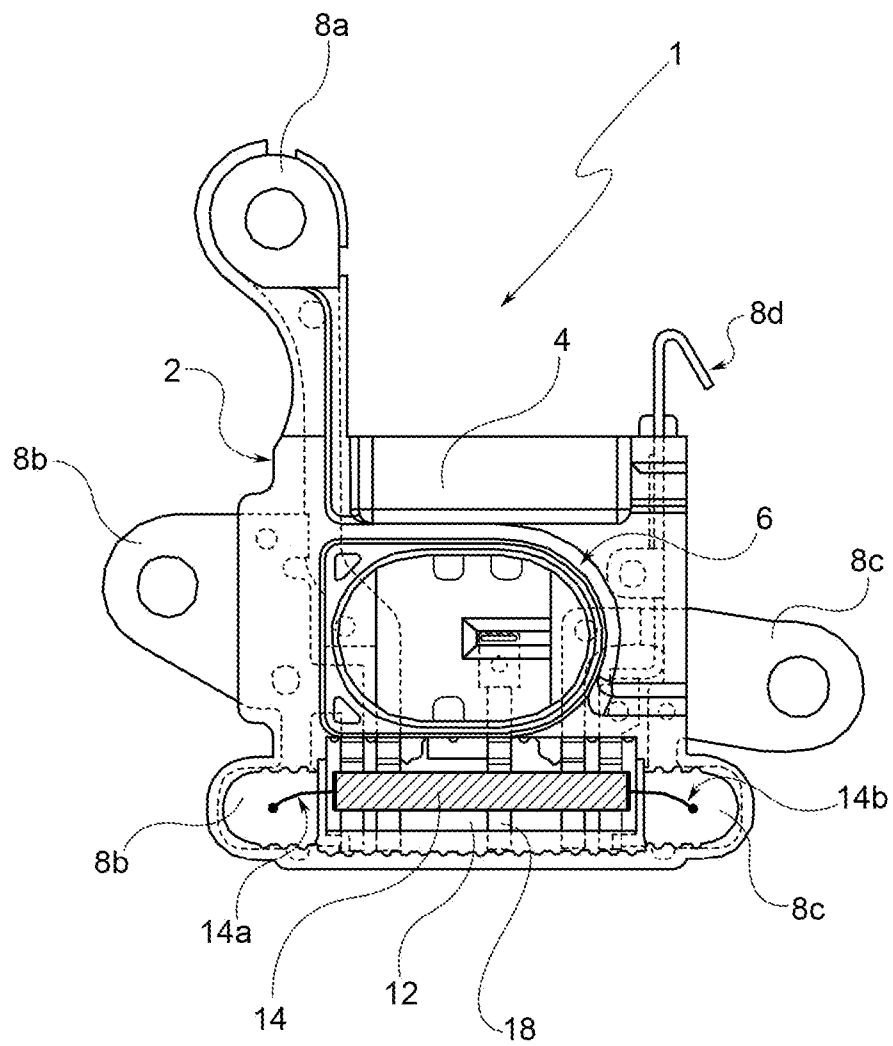


FIG. 2

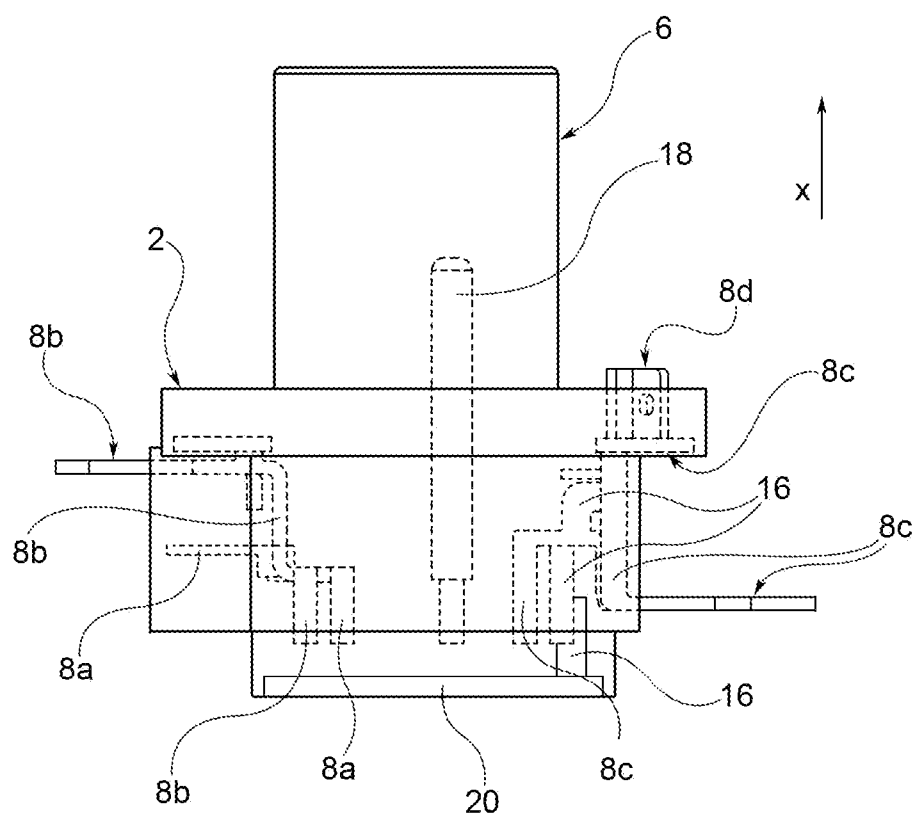


FIG. 3

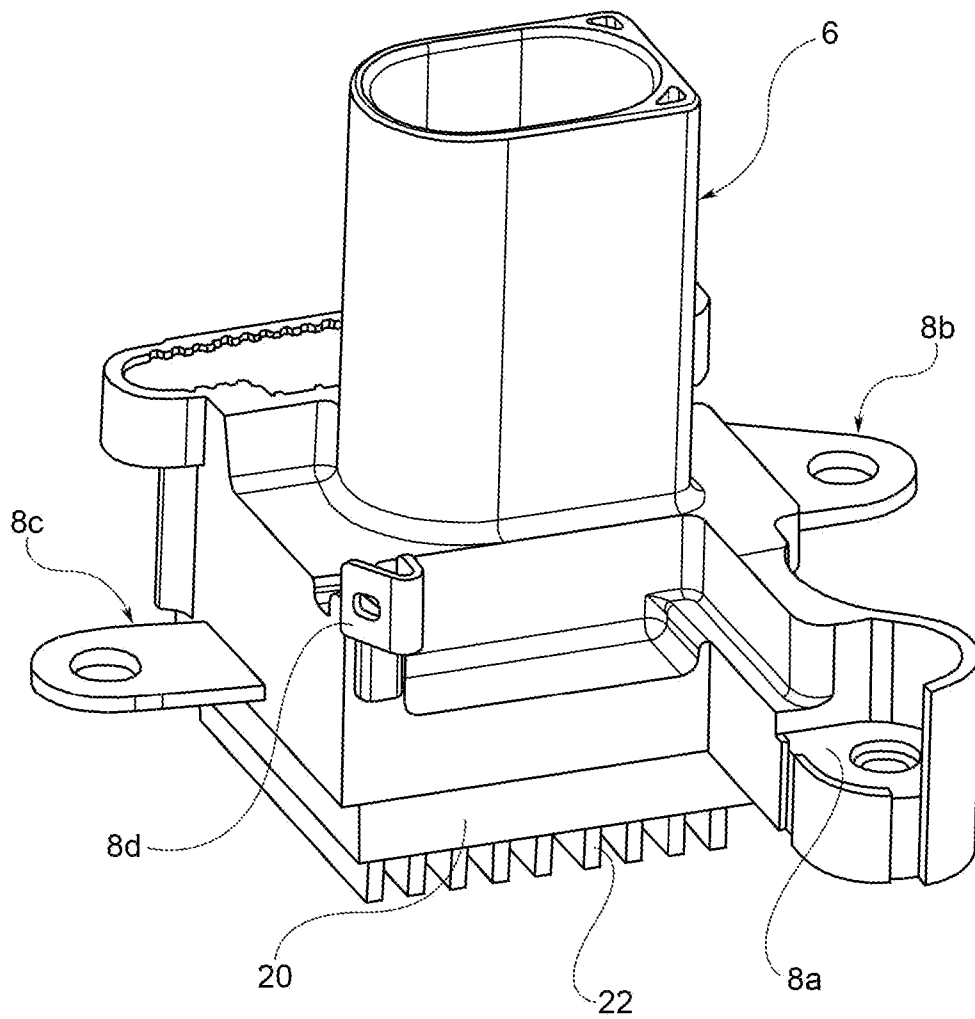


FIG. 4

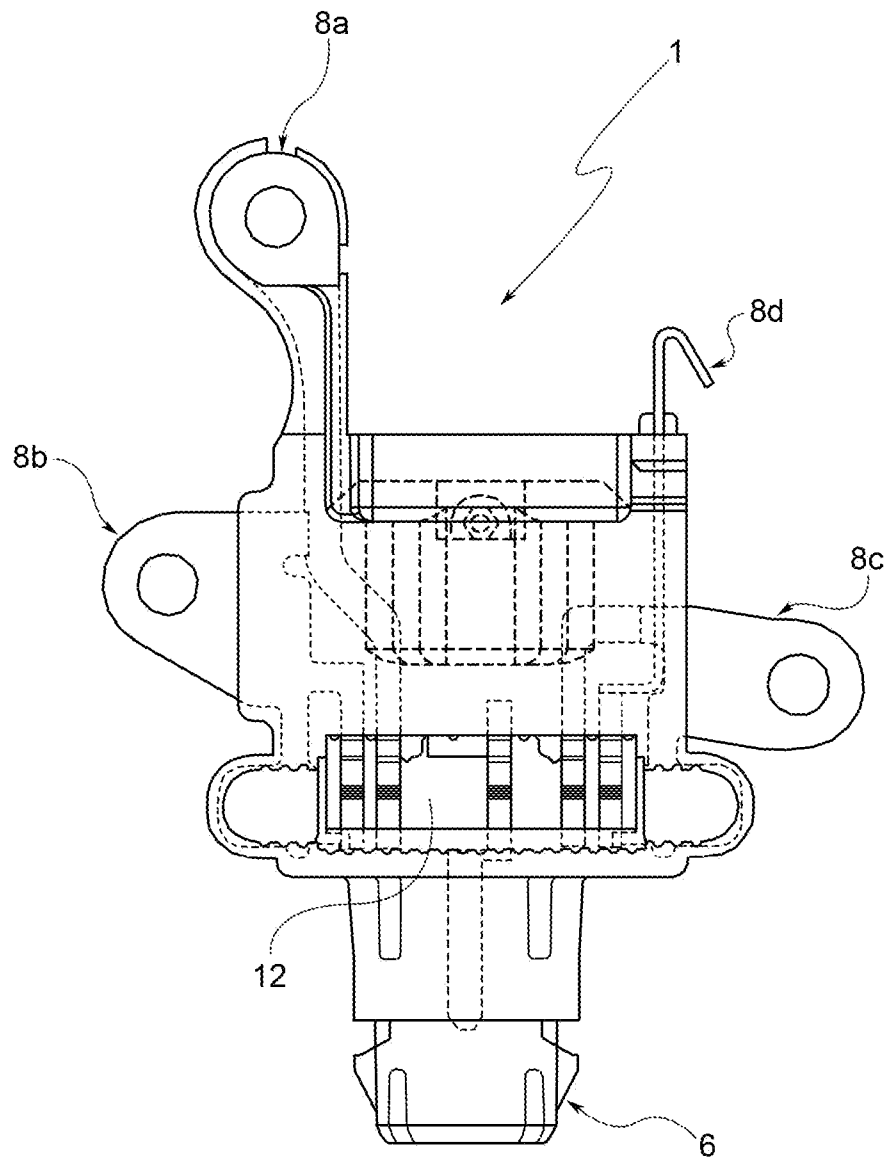


FIG. 5

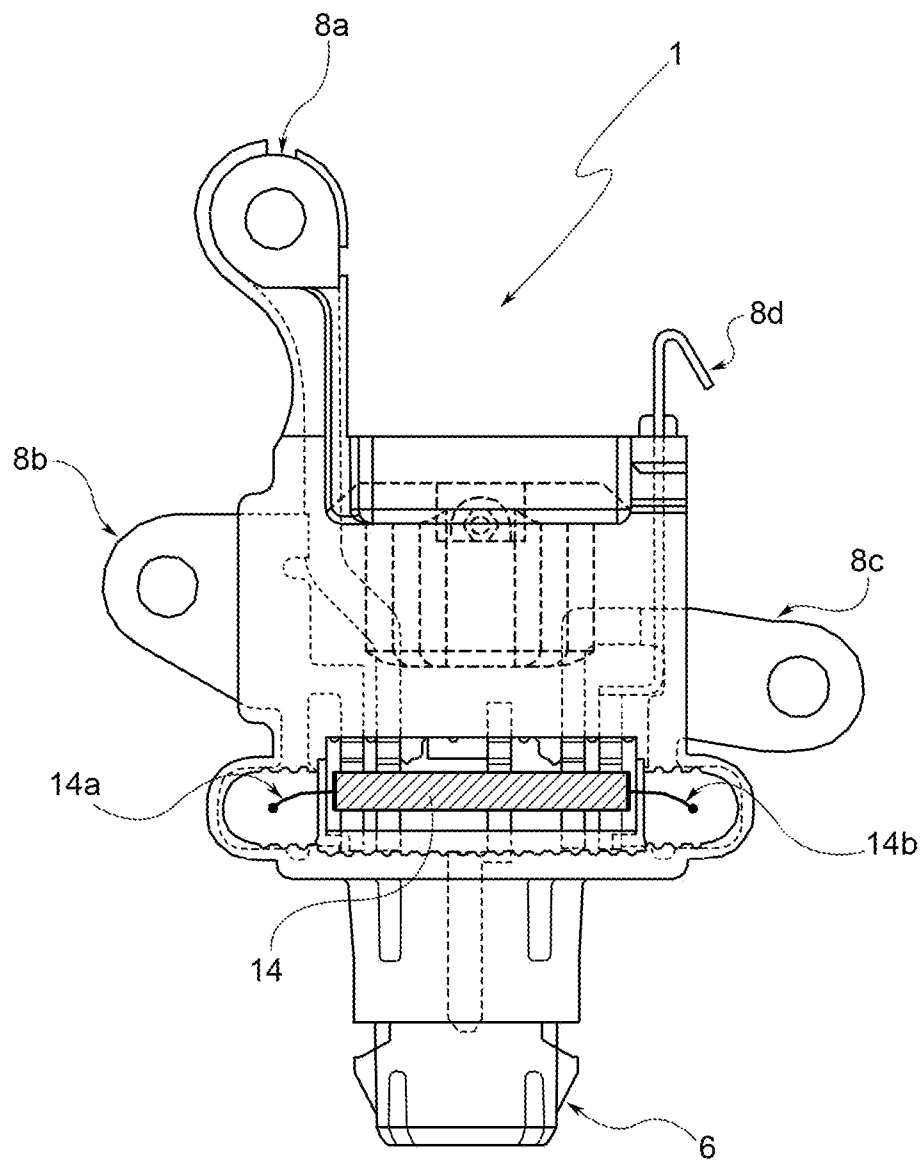


FIG. 6

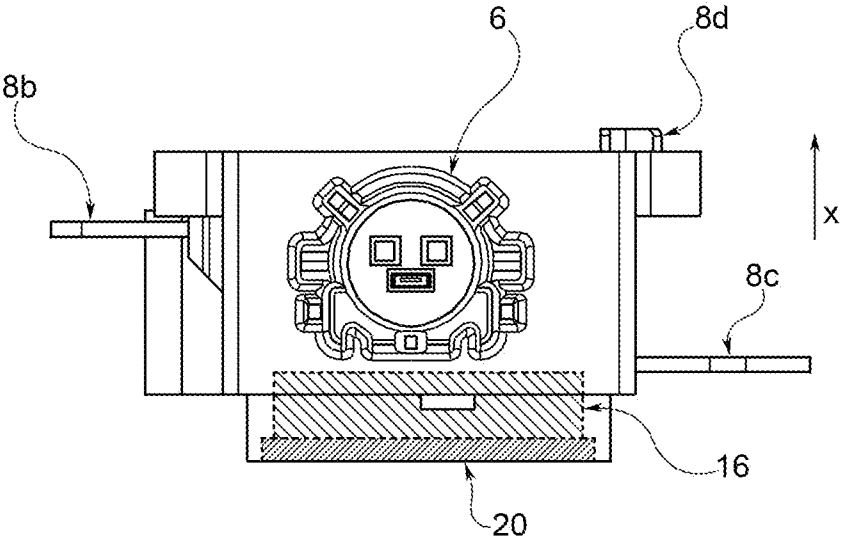


FIG. 7

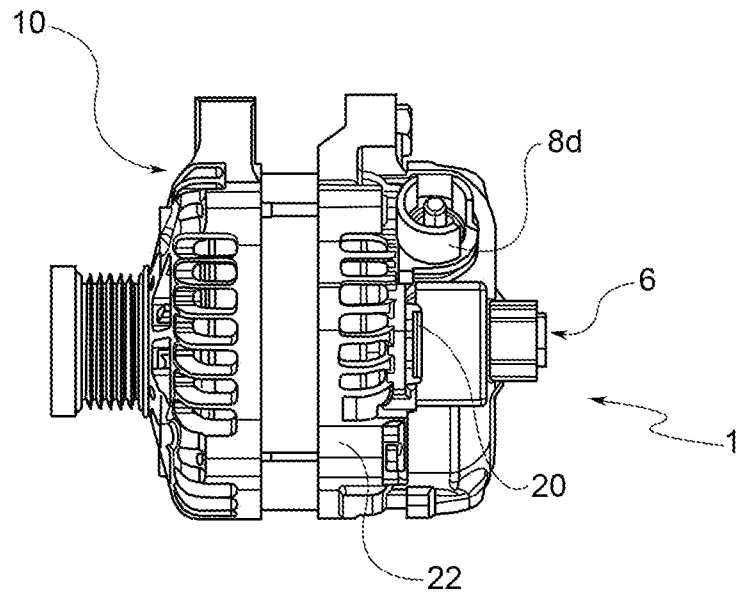


FIG. 8

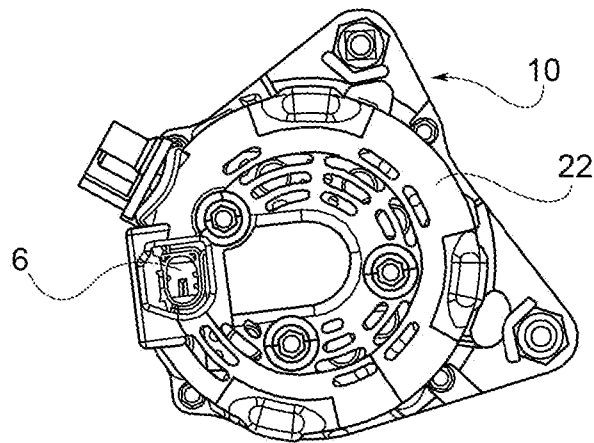


FIG. 9

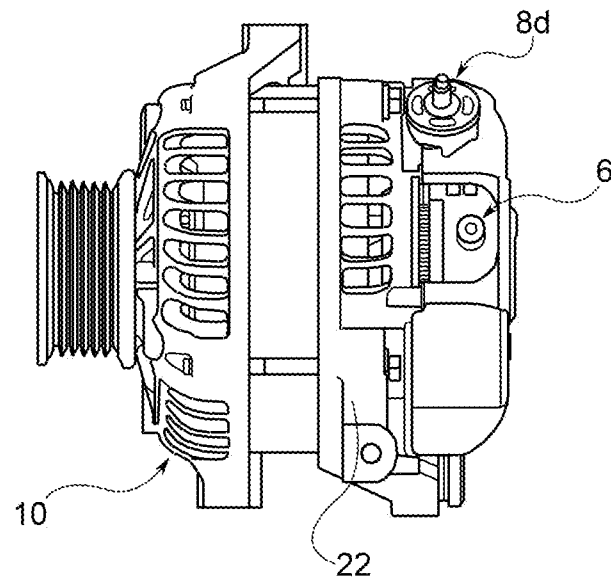


FIG. 10

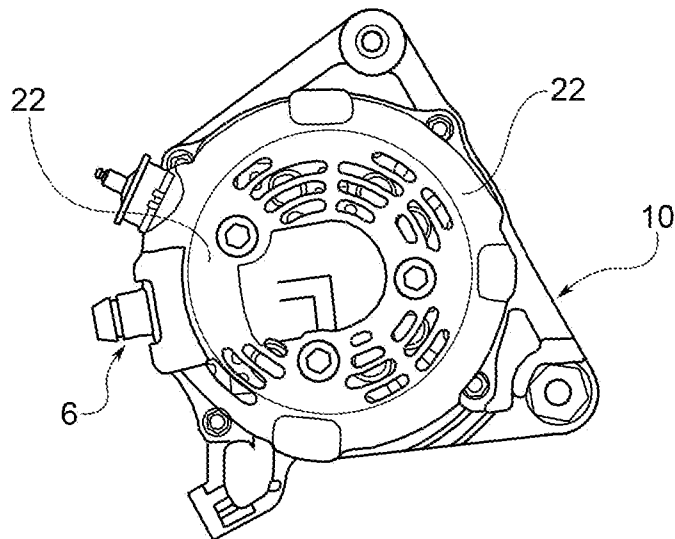


FIG. 11

INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2012/051687

A. CLASSIFICATION OF SUBJECT MATTER
INV. H02K19/36 H02K11/02
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
H02K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EP0-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2008/054856 A1 (LYBBERT JUSTIN [US] LYBBERT JUSTIN B [US]) 6 March 2008 (2008-03-06) paragraphs [0036], [0042], [0043], [0045]; claims 1,9,10,11; figure 4 -----	1-3,5
A	EP 0 731 550 A2 (MITSUBISHI ELECTRIC CORP [JP]) 11 September 1996 (1996-09-11) column 4, line 58 - column 6, line 40; figures 1-6 -----	1-3,5
A	US 2010/133961 A1 (SHIRAKATA YUJI [JP] ET AL) 3 June 2010 (2010-06-03) paragraph [0023]; figure 5 -----	1,2,4,5

☐

Further documents are listed in the continuation of Box C.

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See patent family annex.

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Date of the actual completion of the international search

15 June 2012

Date of mailing of the international search report

25/06/2012

Name and mailing address of the ISA/

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040,
Fax: (+31-70) 340-3016

Authorized officer

Contreras Sampayo, J

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/IB2012/051687

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